Missouri Department of Natural Resources

Total Maximum Daily Load Information Sheet

Big Creek

Waterbody Segment at a Glance:

County: Iron
Nearby Cities: Chloride, Glover
Length of impairment: 4.0 miles
Pollutant: Metals
Source: Lead smelter


State map showing location of watershed

TMDL Priority Ranking: TMDL approved 2006

Description of the Problem

Beneficial uses of Big Creek

- Livestock and Wildlife Watering
- Protection of Warm Water Aquatic Life
- Protection of Human Health associated with Fish Consumption

Use that is impaired

- Protection of Warm Water Aquatic Life

Standards that apply

- Missouri Water Quality Standards (WQS) for metals found in 10 CSR 20-7.031(4)(B)1 state: Water contaminants shall not cause the criteria in Tables A and B to be exceeded. Concentrations of these substances in bottom sediments or waters shall not harm benthic organisms and shall not accumulate through the food chain in harmful concentrations, nor shall state and federal maximum fish tissue levels for fish consumption be exceeded.
- Numeric standards for metals are dependent on the hardness[1] of the water. The current specific WQS from Table A for cadmium (Cd), zinc (Zn) and lead (Pb) are as follows:

The chronic standards for Big Creek, using a total hardness of 110 mg/L[2], are 1.1 µg/L Cd, 172 µg/L Zn and 9 µg/L Pb. These are expressed as total recoverable metals, rather than dissolved metals.

[1] The amount of dissolved calcium and magnesium in the water.
[2] mg/L = milligrams per liter or parts per million; µg/L = micrograms per liter or parts per billion

The standards for Scoggins Branch, a tributary to Big Creek, use acute criteria because it is an unclassified stream. Based on a total hardness of 235 mg/L, they are 8.1 µg/L for Cd, 337 for Zn and 150 for Pb.

However, the most recent (Dec. 31, 2005) Missouri Water Quality Standards' revision includes new metals criteria for cadmium, zinc, lead and other metals. For the protection of aquatic life, the new criteria for metals (other than mercury[3]) shall be expressed in µg/L of dissolved metal. These new standards are calculated by a separate formula for each metal and hardness combination. They are used as the targets for the cadmium, zinc and lead TMDLs.

Background Information and Water Quality Data

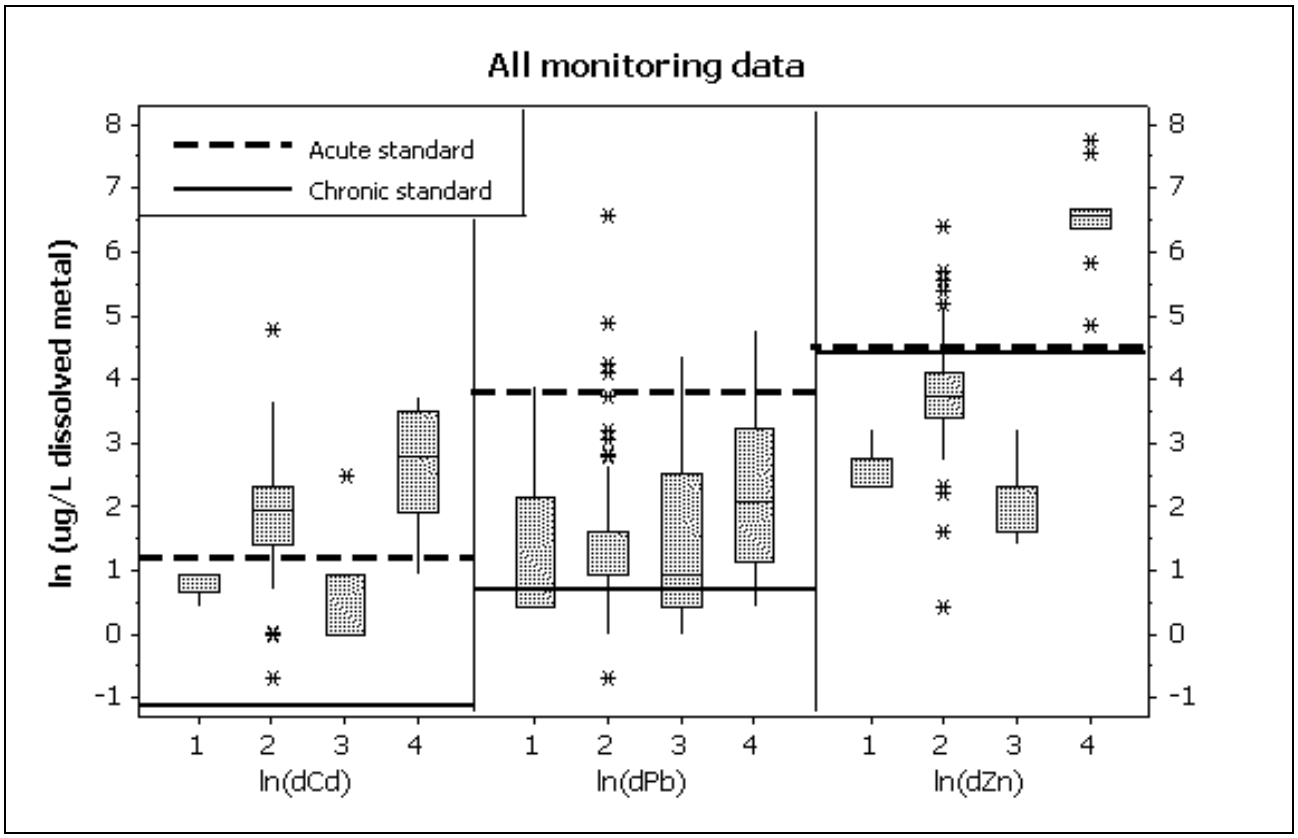
The metal smelter site near Glover contributes significant quantities of heavy metals to Big Creek in Iron County and to Scoggins Branch. Metals find their way to the stream via fallout from smokestack emissions, fugitive dusts and drainage from smelter slag (waste) piles. Many of the airborne metal dusts that settle to the ground in the immediate smelter area are captured by a wastewater and stormwater treatment system installed several years ago. The installation of this system significantly lowered the amounts of cadmium and lead entering Big Creek. Despite the construction and operation of this wastewater treatment system, some problems remain. The U.S. Geological Survey has documented elevated levels of cadmium in fish in Big Creek, and the smelter is the only likely significant cadmium source in the watershed. Water quality monitoring has detected large amounts of zinc in Scoggins Branch and the department has documented potential toxicity to aquatic life in Big Creek (probably due to zinc). The data also show lead to be a concern.

In 2002 and 2003 the Department of Natural Resources conducted a study of the aquatic invertebrate animals (like insect larvae and crayfish) in Big Creek in the vicinity of the smelter. Sampling points 0.1 mile and 0.5 miles downstream of the smelter showed impairment of the invertebrate community, especially mayflies, a group that are sensitive to metals pollution. A sampling point on Big Creek five miles below the smelter also showed impairment of the aquatic invertebrate community but the pattern of impairment did not suggest metals pollution as the cause.

Although operations at Glover Smelter were indefinitely suspended in December 2003 (due to a decrease in the United States' demand for lead), Big Creek is still contaminated by heavy metals. Comparison of water quality data collected above the smelter, both in Big Creek and Scoggins Branch, indicate the impact of the smelter. A compilation of the data is shown by the box plots on the next page. These box plots show the monitoring data from left to right for the natural log (ln) dissolved cadmium (dCd), dissolved lead (dPb), and dissolved zinc (dZn) at these monitoring points: 1.) Big Creek above smelter, 2.) Big Creek below smelter, 3.) Scoggins Branch above slag piles, 4.) Scoggins Branch below slag piles. See also the map on page 4.

The U.S. Environmental Protection Agency approved TMDLs for cadmium, lead and zinc in Big Creek on Feb. 17, 2006.

[3] The criteria for mercury are expressed in total recoverable form.



To read the box plots: The box represents the 25th -75th quartiles and the middle line is the median of the data. The "whiskers" (lines outside the boxes) represent 1.5 times the interquartile range (you can use it to look at a rough distribution of the data). The asterisks are "outliers".

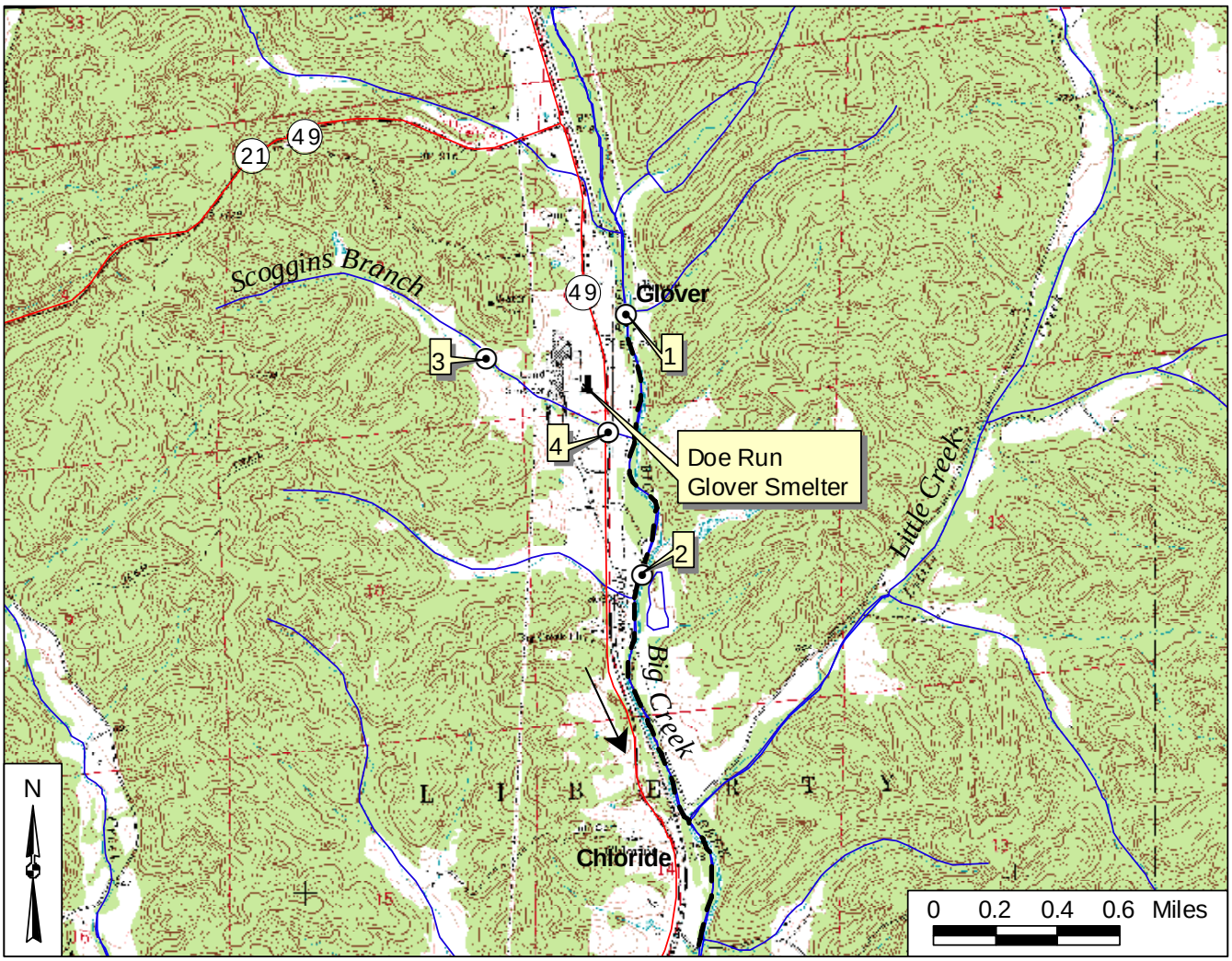
Glover Smelter operates a treatment facility (as mentioned above) for process wastewater and sanitary wastewater from the site, which discharges to Scoggins Branch and then flows to Big Creek. Associated with the smelter facility there are also waste piles, which are regulated under a storm water permit. As with all wastewater discharges in Missouri, Glover Smelter has to meet the requirements these discharge permits. The TMDL will be implemented through adjustments to the permits.

Other actions to address metal contamination of Big Creek and Scoggins Branch involve a Consent Decree that was executed between ASARCO Incorporated (former owner of the smelter) and the department on Sept. 6, 1994. The decree required a series of investigations and remedial actions at Glover Smelter and Refinery. The Site Assessment and Investigation of the Glover plant was finalized and submitted to the department Nov. 24, 1998. A Remedy Work Plan for Glover Lead Facility was published in February 2001. Actions dictated by the plan to improve water quality included:

- Construction of runoff and erosion control structures along Scoggins Creek
- Capping the two inactive slag piles and isolating them from the local hydrology

Work was completed on the slag piles in 2001.

Big Creek near Glover in Iron County, Missouri, with Sampling Sites



Impaired Section → Direction of Flow

Site Index
1 – Big Creek 0.1 mile above Glover Smelter
2 – Big Creek 0.5 mile below Glover Smelter
3 – Scoggins Branch above Glover Smelter
4 – Scoggins Branch below Glover Smelter

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